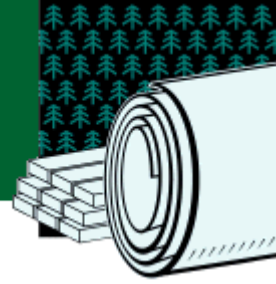


FOREST PRODUCTS

Project Fact Sheet



APPLICATION OF A DEVICE FOR UNIFORM WEB DRYING AND PREHEATING USING MICROWAVE ENERGY

BENEFITS

- Reduces water load delivered to dryer
- Increases dryer can temperatures and dryer efficiency
- Lowers capital costs by reducing number of dryer cans needed
- Compensates for inherent inefficiency of conduction heating
- Potentially lowers maintenance costs
- Reduces overall energy use by 12 percent

APPLICATIONS

This technology would be an add-on to the paper machine. The potential market share for microwave technology is estimated to be 70–80 percent of the paperboard/paper market. Expected year of commercialization is 2003 to 2004, with market saturation 15 years later.

Technique Will Increase Press Dewatering, Reduce Dryer Energy Requirements, and Enhance Dryer Productivity

At present, steam-heated dryer cylinders are used to carry out the drying process on paper machines, but the energy efficiency and productivity of this system could be significantly improved. Studies of the potential for using microwave technology in the drying process began in the 1960s. Previous microwave investigations indicated favorable economics and no physical damage to the paper.

Recently, Industrial Microwave Systems (IMS) has made improvements to the uniformity of microwave energy and increased the technology's energy efficiency to 85 percent (double the efficiency of infrared systems). Researchers will evaluate the technical and economic aspects of the improved system for application to web drying. Since the optimal amount of water is removed when the temperature is uniform throughout the sheet, the internal heating of the sheet by microwaves is expected to result in a more uniform temperature and greater water removal.

The new technology can be used in the press section to preheat the web and reduce the water load delivered to the dryer. It can also be applied to the dryer as a pre-heater, raising the temperature of the dryer cans. It can also supplement existing dryer cans that operate by conduction heating. In any of these uses, the benefit is greater energy efficiency of the process. In the dryer section, the technology also enhances productivity by eliminating over-drying and increasing the drying rate.



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ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

PROJECT DESCRIPTION

Goal: To evaluate the technical and economic feasibility of applying new microwave technology to heating and drying the paper web in paper machines.

Objectives of this three-year project are: (1) evaluate the use of microwave energy for web preheating to enhance liquid water removal and increase drying productivity (for moisture profile leveling to reduce over-drying and for incremental high-rate, high-efficiency, low-investment drying); and (2) move the technology from the laboratory to commercialization.

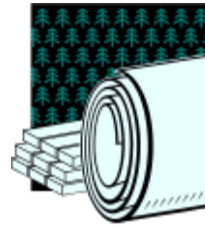
PROGRESS & MILESTONES

Tasks and Milestones include the following:

- Researchers will perform experiments using narrow-web, low-speed conditions with the existing system from IMS to determine the best applications and develop a model for scale-up.
- They will then perform experiments with a wide-web, low-speed operation to ensure uniform results as the paper web changes.
- The energy and economic analyses will be updated and the best applications for the system ranked.
- The technology will be demonstrated on a high-speed, high-power system to confirm its efficiency and design and evaluate transport and vapor-removal issues.
- The final design procedure and guidelines will be confirmed.
- The energy and economic analyses will be updated again and the best applications assessed.

Completed work:

- Defined an appropriate slot profile based on the dielectric properties of different grades of paper.
- Developed a concept for implementing a variable geometry waveguide for on-line control of microwave energy input into the sheet.
- Established techniques for the measurement of the dielectric loss coefficient as a function of moisture content.
- IMS developed a choking system to eliminate leakage from the system.
- A design/scale-up model is being developed to assist in assessment of energy efficiency and identify best applications.



PROJECT PARTNERS

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